

INTERNATIONAL SPACE STATION UPDATE

Flight controllers continue to work communications problem

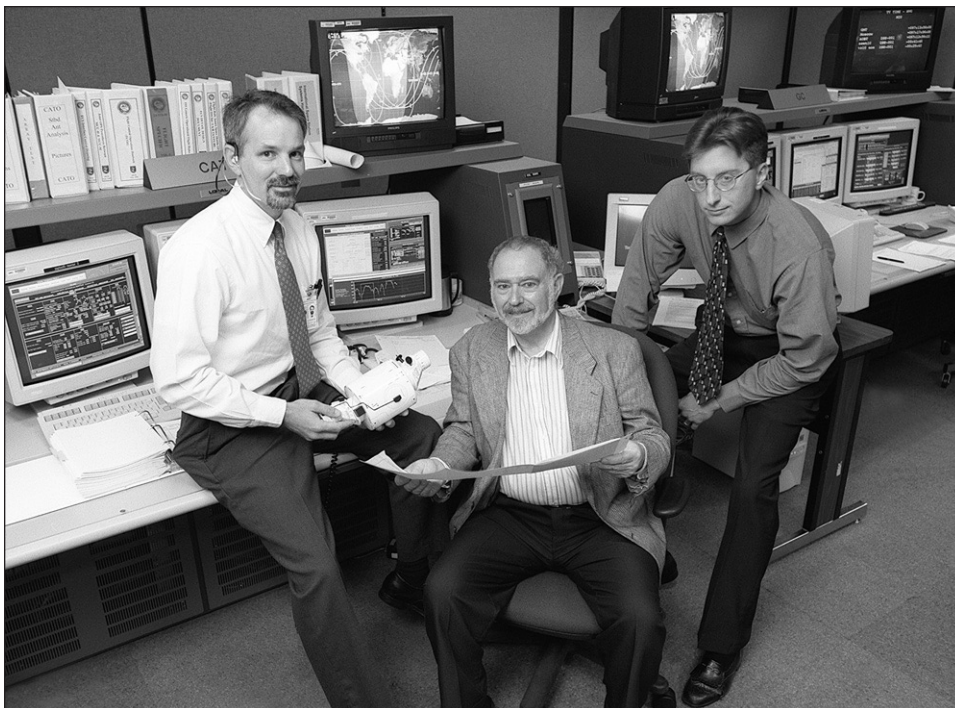
International Space Station flight controllers in Houston and Moscow continue to analyze a persistent low signal strength reading on the Starboard Omni antenna on Unity. The antenna, one of two used by the U.S. Early Communications System, has shown degradation in its ability to receive signals from the Tracking and Data Relay Satellite when the station is in certain orientations. Forward link signal is lost in certain antenna regions.

"We are continuing to function fine with this anomaly in the system," said Mark Martin, NASA communications and tracking officer. "We just have to take more care in our commanding so that we don't attempt to command to the vehicle when we are operating in the degraded region of the antenna."

On March 3, flight controllers noticed a definitive change in the performance of the antenna. Since that time, the Flight Control Team, supported by engineering experts in the Mission Evaluation Room, has conducted a number of tests to understand and characterize the problem. Downlinked video from a camera on board the Zarya module ruled out any type of extreme antenna movement. Flight controllers had suspected that the antenna had moved, resulting in the change in the signal pattern.

The tests were complicated by the fact that Zarya's Motion Control System is powered off most of the time during this phase of the mission. As a result, no direct information on the attitude of the spacecraft and where the antenna is pointing at any given time is readily available.

United Space Alliance employee Tim Stockdale, a pointer from the Operations



JSC Photo S99-04701 by Robert Markowitz

Mark Martin, left, NASA communications and tracking officer, Louto Barquet, who works on the communications and tracking function for The Boeing Co. in the Mission Evaluation Room, and United Space Alliance employee Tim Stockdale, a pointer from the Operations Division, discuss problems associated with an anomalous Starboard Omni antenna aboard the Unity module.

Division, developed a unique technique to ascertain this information based upon trajectory information of the ISS and observed signal strengths. Working with the communications and tracking officers to determine the arrival and loss of signal, he deduced a halfway point and backed out the attitude rate and the spin of the vehicle. Using software tools to establish the look angles to the Tracking and Data Relay Satellite, he was able to correlate the data to determine that

there was a hole in the antenna pattern. He then established the look angles to the TDRS with respect to the anomalous antenna to deduce the problem.

"We were able to rule out blockage after we performed some additional tests on the phased-array antennas which project in the same area as the anomalous Omni antenna," said Stockdale. "These antennas indicated normal signals throughout the whole range of look angles, thereby ruling out blockage."

Flight planners for the STS-96 mission are budgeting time in the mission to survey the antenna with the shuttle's robotic arm prior to a space walk by astronauts Tammy Jernigan and Dan Barry. No repair hardware is planned to be taken aboard *Discovery* since the slightly reduced communications capability has had minimal impact on operations. If the problem is with the antenna itself, as flight controllers suspect, the STS-101 crew will install a new antenna during the mission currently scheduled for December.

ISS Flight Director Sally Davis is proud of the work her team has done in resolving this anomaly. "I'm very pleasantly surprised with the maturity and the analytical capabilities of these flight controllers. I am very proud to be associated with them."

Louto Barquet, who works on the communications and tracking function for The Boeing Co. in the MER, echoes this sentiment. "Tremendous teamwork has been involved in defining and resolving this anomaly. Employees at White Sands and Goddard have been involved as well as JSC flight controllers and engineers, United Space Alliance engineers, other contractor personnel and us."

The U.S. Communications System, installed on shuttle mission STS-88 last year, is one of two complementary communications systems on the station, including a Russian communications system on board Zarya. ■

ISS viewing opportunities from the ground can be found on the Internet at: <http://spaceflight.nasa.gov/realdata/sightings/>

Center is ready to kick off its annual Savings Bond campaign this month

JSC's 1999 U.S. Savings Bond campaign begins May 17 and continues through May 28. Employees will receive more information about savings bonds during the campaign.

Buying savings bonds is one of those fortunate transactions where both the buyer and seller profit. Interest rates are based on market yields of actively traded Treasury notes and bills and are adjusted every six months, climbing as market rates increase. Each May 1 and November 1, the Treasury announces the rate which is 90 percent of the average five-year Treasury security yields for the six months before the rate announcement. Bonds earn these rates right from the start; the current rate is 4.6 percent (announced November 1). The new rate was announced May 1. Bonds cashed before five years are subject to a three-month interest penalty.



Savings bonds provide numerous other advantages. Interest earned is not subject to state or local taxes, and federal tax liability can be deferred until the bonds are cashed. In addition, when bonds are redeemed for the purpose of financing higher education—yours or your children's—interest earned under some circumstances is completely tax free.

NASA's goals this year are to have a 50 percent participation rate with an overall increase of at least 5 percent participation and a 10 percent increase in the level of savings by current participants.

For additional information, contact your directorate campaign coordinator or Teresa Sullivan at x31034. ■

Exploration Office hosts amateur rocket launch

On April 8, JSC's Exploration Office hosted an amateur rocket launch on the antenna range behind Bldg. 14. Participants included JSC co-ops, German graduate students and members of the NASA-Houston Rocket Club.

"JSC has hosted numerous regional and national model rocket competitions

over the past thirty years," said John Connolly, who serves as the "launch director" for events sponsored by the Exploration Office. "Of course, we're always extremely safety conscious. All the rockets need to correspond to basic principles of stable rocket design, as well as local rocketry rules. The rockets also have to abide by

altitude limits set by local air traffic."

There is no schedule for the launches. The events are usually held a few times during the year. Some of the launches are held to celebrate events such as a co-op's last week in the Exploration Office or even the arrival of daylight savings time. "The launch window is an hour longer," Connolly said.

The NASA-Houston Rocket Club holds launches on the first and third Saturdays of every month. Everyone is welcome to attend. ■

On April 8, JSC rocketeers gathered on the antenna range behind Bldg. 14 to launch their homemade rockets. The launch, sponsored by the Exploration Office, was a friendly competition among JSC co-ops, German graduate students and other model rocket enthusiasts.



JSC Photo S99-04861 by James Blair